

What is claimed is:

1. An artificial antigen presenting cell comprising:
- a. a liposome components;
 - 5 b. an MHC components;
 - c. an antigen components; and
 - d. an accessory molecule components, wherein said antigen components is in contact with at least said MHC components, and said MHC and said accessory components are in contact with at least said liposome components, said accessory molecule components further providing for a stabilizing property to an interaction between a T cell receptor and said MHC and said antigen components.
- 10
2. An artificial antigen presenting cell according to claim 1 wherein said liposome components comprises a lipid, said lipid selected from the group consisting of a phospholipid, a neutral phospholipid, and phosphatidylcholine.
- 15
3. An artificial antigen presenting cell according to claim 2 further comprising a surfactant components wherein said surfactant components is cholesterol and is in contact with at least said liposome components.
- 20
4. An artificial antigen presenting cell according to claim 3 wherein a label is associated with at least one of the group selected from the group consisting of a lipid bilayer of said liposome components, a lipid of said liposome components, an antigen components, an MHC components, and an accessory components.

66707 " 3034400

5. An artificial antigen presenting cell according to claim 4 wherein said label is selected from the group consisting of biotin, vancomycin, a fluorochrome, FITC, and a radiolabel.
- 5 6. An artificial antigen presenting cell according to claim 3 wherein said antigen is presented by an MHC components for contact with and recognition by a T cell receptor, said antigen selected from the group consisting of a peptide, a peptide derived from the recipient for graft versus host diseases, a cancer cell-derived peptide, a peptide derived from an allergen, a donor-derived peptide, a pathogen-derived molecule, a
10 peptide derived by epitope mapping, a self-derived molecule, a self-derived molecule that has sequence identity with said pathogen-derived antigen, said sequence identity having a range selected from the group consisting of between 5 and 100%, 15 and 100%, 35 and 100%, and 50 and 100%.
- 15 7. An artificial antigen presenting cell according to claim 3 wherein said MHC components is selected from the group consisting of a natural MHC, a recombinant MHC having sufficient composition for binding an antigen, an $\alpha 1$ and $\alpha 2$ subunit set of a Class I MHC, an $\alpha 1$ and $\beta 2$ subunit set of a Class II MHC, a peptide derived from said α and β subunits, and a portion of a natural MHC having sufficient composition for
20 binding an antigen.
8. An artificial antigen presenting cell according to claim 3 wherein said accessory molecule components is selected from the group consisting of LFA-1, CD11a/18, CD54(ICAM-1), CD106(VCAM), and CD49d/29(VLA-4), and antibodies to the
25 ligands of the foregoing molecules.

9. An artificial antigen presenting cell according to claim 3 further comprising a GM-1 protein components, said GM-1 components contacting at least said liposome components.
- 5 10. An artificial antigen presenting cell according to claim 9 further comprising a cholera β subunit components, wherein said β subunit components are connected to at least one of said MHC, and said accessory components and further contacts at least said GM-1 components.
- 10 11. An artificial antigen presenting cell according to claim 1 further comprising molecular components selected from the group consisting of a co-stimulatory molecule components, an adhesion molecule components, a cell modulation molecule components, GM-1 protein components, cholera toxin β subunit components, an irrelevant molecule components for binding said artificial presenting cell to a solid support or binding a label, and a label components.
- 15 12. An artificial antigen presenting cell according to claim 11 wherein said liposome components comprises a lipid, said lipid selected from the group consisting of a phospholipid, a neutral phospholipid, and phosphatidylcholine.
- 20 13. An artificial antigen presenting cell according to claim 12 further comprising a surfactant components wherein said surfactant components is cholesterol and is in contact with at least said liposome components.
- 25 14. An artificial antigen presenting cell according to claim 13 wherein a label is associated with at least one of the group selected from the group consisting of a lipid bilayer of said liposome components, a lipid of said liposome components, an antigen

components, an MHC components, a co-stimulatory molecule components, an adhesion molecule components, a cell modulation molecule components, GM-1 protein components, cholera toxin β subunit components, an irrelevant molecule components and an accessory components.

5

15. An artificial antigen presenting cell according to claim 14 wherein said label is selected from the group consisting of biotin, vancomycin, a fluorochrome, FITC, and a radiolabel.

10

16. An artificial antigen presenting cell according to claim 13 wherein said GM-1 component contacts at least said liposome components.

15

17. An artificial antigen presenting cell according to claim 16 wherein said cholera β subunit components is connected to at least one of said co-stimulatory molecule components, an adhesion molecule components, a cell modulation molecule components, an irrelevant molecule components, and said accessory components and further contacts at least said GM-1 components.

20

18. An artificial antigen presenting cell according to claim 13 wherein said antigen is presented by an MHC components for contact with and recognition by a T cell receptor, said antigen selected from the group consisting of a peptide, a peptide derived from the recipient for graft versus host diseases, a cancer cell-derived peptide, a peptide derived from an allergen, a donor-derived peptide, a pathogen-derived molecule, a peptide derived by epitope mapping, a self-derived molecule, a self-derived molecule that has sequence identity with said pathogen-derived antigen, said sequence identity having a range selected from the group consisting of between 5 and 100%, 15 and 100%, 35 and 100%, and 50 and 100%.

25

19. An artificial antigen presenting cell according to claim 13 wherein said MHC components is selected from the group consisting of a natural MHC, a recombinant MHC having sufficient composition for binding an antigen, an $\alpha 1$ and $\alpha 2$ subunit set of a Class I MHC, an $\alpha 1$ and $\beta 2$ subunit set of a Class II MHC, a peptide derived from said α and β subunits, and a portion of a natural MHC having sufficient composition for binding an antigen.
20. An artificial antigen presenting cell according to claim 13 wherein said accessory molecule components is selected from the group consisting of LFA-1, CD11a/18, CD54(ICAM-1), CD106(VCAM), and CD49d/29(VLA-4), and antibodies to the ligands of the foregoing molecules.
21. An artificial antigen presenting cell according to claim 13 wherein said co-stimulatory molecule components is selected from the group consisting of B7-1, B7-2, CD5, CD9, CD2, CD40 and antibodies to their ligands.
22. An artificial antigen presenting cell according to claim 13 wherein said cell modulation molecule components is selected from the group consisting of CD72, CD22, CD58, anti-CD22, anti-CD58, anti-CD72, anti-cytokine receptor, and anti-chemokine receptor.
23. An artificial antigen presenting cell according to claim 13 wherein said adhesion molecule components is selected from the group consisting of ICAM-1, ICAM-2, GlyCAM-1, CD34, anti-LFA-1, anti-CD44, anti-beta7, chemokines, CXCR4, CCR5, anti-selectin L, anti-selectin E, and anti-selectin P.

24. An artificial antigen presenting cell according to 13 wherein said irrelevant molecule components, has a moiety for binding a solid support either directly or through an intermediate molecule, or for binding a label, said solid support further selected from the group consisting of a glass bead from 25 to 300 μm diameter, and a magnetic bead
5 from 25 to 300 μm diameter.
25. An artificial antigen presenting cell according to claim 24 wherein said solid support is coated with a lipid selected from the group consisting of a phospholipid, a neutral phospholipid, and phosphatidylcholine, said solid support further having capture
10 molecules, said capture molecules further having the capacity to bind specifically to said irrelevant molecule components.
26. An artificial antigen presenting cell according to claim 25 wherein said capture molecules are noncovalently associated with said lipid.
- 15 27. An artificial antigen presenting cell comprising:
- a. a liposome components;
 - b. an MHC components;
 - c. an antigen components,
 - 20 d. an accessory molecule components; and
 - e. a co-stimulatory molecule components, wherein said antigen components is in contact with at least said MHC components, said MHC, accessory and co-stimulatory components are in contact with at least said liposome components, said accessory molecule components further providing for a stabilizing property
25 to an interaction between a T cell receptor and said MHC and said antigen components.

28. An artificial antigen presenting cell according to claim 27 wherein said liposome components comprises a lipid, said lipid selected from the group consisting of a phospholipid, a neutral phospholipid, and phosphotidylcholine.
29. An artificial antigen presenting cell according to claim 28 further comprising a
5 surfactant components wherein said surfactant components is cholesterol and is in contact with at least said liposome components.
30. An artificial antigen presenting cell according to claim 29 wherein a label is associated with at least one of the group selected from the group consisting of a lipid bilayer of
10 said liposome components, a lipid of said liposome components, an antigen, an MHC components, a co-stimulatory components, and an accessory components.
31. An artificial antigen presenting cell according to claim 30 wherein said label is selected from the group consisting of biotin, vancomycin, a fluorochrome, FITC, and a
15 radiolabel.
32. An artificial antigen presenting cell according to claim 29 wherein said antigen is presented by an MHC components for contact with and recognition by a T cell receptor, said antigen selected from the group consisting of a peptide, a peptide derived from the recipient for graft versus host diseases, a cancer cell-derived peptide, a peptide
20 derived from an allergen, a donor-derived peptide, a pathogen-derived molecule, a peptide derived by epitope mapping, a self-derived molecule, a self-derived molecule that has sequence identity with said pathogen-derived antigen, said sequence identity having a range selected from the group consisting of between 5 and 100%, 15 and
25 100%, 35 and 100%, and 50 and 100%.

33. An artificial antigen presenting cell according to claim 29 wherein said MHC components is selected from the group consisting of a natural MHC, a recombinant MHC having sufficient composition for binding an antigen, an $\alpha 1$ and $\alpha 2$ subunit set of a Class I MHC, an $\alpha 1$ and $\beta 2$ subunit set of a Class II MHC, a peptide derived from said α and β subunits, and a portion of a natural MHC having sufficient composition for binding an antigen.
34. An artificial antigen presenting cell according to claim 29 wherein said accessory molecule components is LFA-1, CD11a/18, CD54(ICAM-1), CD106(VCAM), and CD49d/29(VLA-4), and antibodies to the ligands of the foregoing molecules.
35. An artificial antigen presenting cell according to claim 29 wherein said co-stimulatory molecule components is selected from the group consisting of B7-1, B7-2, CD5, CD9, CD2, CD40 and antibodies to their ligands.
36. An artificial antigen presenting cell according to claim 29 further comprising a GM-1 protein components, said GM-1 components contacting at least said liposome components.
37. An artificial antigen presenting cell according to claim 36 further comprising a cholera β subunit components wherein said β subunit components in connected to at least one of said MHC, said co-stimulatory, and said accessory components and further contacts at least said GM-1 components.
38. An artificial antigen presenting cell according to claim 27 further comprising molecular components selected from the group consisting of an adhesion molecule components, a cell modulation molecule components, GM-1 protein components, cholera toxin β

subunit components, an irrelevant molecule components for binding said artificial presenting cell to a solid support or binding a label, and a label components.

5 39. An artificial antigen presenting cell according to claim 38 wherein said liposome components comprises a lipid, said lipid selected from the group consisting of a phospholipid, a neutral phospholipid, and phosphatidylcholine.

10 40. An artificial antigen presenting cell according to claim 39 further comprising a surfactant components wherein said surfactant components is cholesterol and is in contact with at least said liposome components.

15 41. An artificial antigen presenting cell according to claim 40 wherein a label is associated with at least one of the group selected from the group consisting of a lipid bilayer of said liposome components, a lipid of said liposome components, an antigen components, an MHC components, a co-stimulatory molecule components, an adhesion molecule components, a cell modulation molecule components, GM-1 protein components, cholera toxin β subunit components, an irrelevant molecule components and an accessory components.

20 42. An artificial antigen presenting cell according to claim 41 wherein said label is selected from the group consisting of biotin, vancomycin, a fluorochrome, FITC, and a radiolabel.

25 43. An artificial antigen presenting cell according to claim 40 wherein said GM-1 components contacts at least said liposome components.

44. An artificial antigen presenting cell according to claim 43 wherein said cholera β subunit components is connected to at least one of said co-stimulatory molecule components, an adhesion molecule components, a cell modulation molecule components, MHC components, an irrelevant molecule components, and said
5 accessory components and further contacts at least said GM-1 components.
45. An artificial antigen presenting cell according to claim 40 wherein said antigen is presented by an MHC components for contact with and recognition by a T cell receptor, said antigen selected from the group consisting of a peptide, a peptide derived
10 from the recipient for graft versus host diseases, a cancer cell-derived peptide, a peptide derived from an allergen, a donor-derived peptide, a pathogen-derived molecule, a peptide derived by epitope mapping, a self-derived molecule, a self-derived molecule that has sequence identity with said pathogen-derived antigen, said sequence identity having a range selected from the group consisting of between 5 and 100%, 15 and
15 100%, 35 and 100%, and 50 and 100%.
46. An artificial antigen presenting cell according to claim 40 wherein said MHC components is selected from the group consisting of a natural MHC, a recombinant MHC having sufficient composition for binding an antigen, an $\alpha 1$ and $\alpha 2$ subunit set of
20 a Class I MHC, an $\alpha 1$ and $\beta 2$ subunit set of a Class II MHC, a peptide derived from said α and β subunits, and a portion of a natural MHC having sufficient composition for binding an antigen.
47. An artificial antigen presenting cell according to claim 40 wherein said accessory
25 molecule components is selected from the group consisting of LFA-1, CD11a/18, CD54(ICAM-1), CD106(VCAM), and CD49d/29(VLA-4), and antibodies to the ligands of the foregoing molecules.

48. An artificial antigen presenting cell according to claim 40 wherein said co-stimulatory molecule components is selected from the group consisting of B7-1, B7-2, CD5, CD9, CD2, CD40 and antibodies to their ligands.
- 5 49. An artificial antigen presenting cell according to claim 40 wherein said cell modulation molecule components is selected from the group consisting of CD72, CD22, CD58, anti-CD22, anti-CD58, anti-CD72, anti-cytokine receptor, and anti-chemokine receptor.
- 10 50. An artificial antigen presenting cell according to claim 40 wherein said adhesion molecule components is selected from the group consisting of ICAM-1, ICAM-2, GlyCAM-1, CD34, anti-LFA-1, anti-CD44, anti-beta7, chemokines, CXCR4, CCR5, anti-selectin L, anti-selectin E, and anti-selectin P.
- 15 51. An artificial antigen presenting cell according to 40 wherein said irrelevant molecule components, has a moiety for binding a solid support either directly or through an intermediate molecule, or for binding a label, said solid support further selected from the group consisting of a glass bead from 25 to 300 μm diameter, and a magnetic bead from 25 to 300 μm diameter.
- 20 52. An artificial antigen presenting cell according to claim 51 wherein said solid support is coated with a lipid selected from the group consisting of a phospholipid, a neutral phospholipid, and phosphatidylcholine, said solid support further having capture molecules, said capture molecules further having the capacity to bind specifically to
- 25 said irrelevant molecule components.

53. An artificial antigen presenting cell according to claim 52 wherein said capture molecules are noncovalently associated with said lipid.

54. An artificial antigen presenting cell comprising:

- 5 f. a liposome components;
 g. an MHC components;
 h. an antigen components,
 i. an accessory molecule components; and
 j. a cell modulation molecule components, wherein said antigen components is in
10 contact with at least said MHC components, said MHC, accessory and cell
 modulation components are in contact with at least said liposome components,
 said accessory molecule components further providing for a stabilizing property
 to an interaction between a T cell receptor and said MHC and said antigen
 components.

15 55. An artificial antigen presenting cell according to claim 54 wherein said liposome
 components comprises a lipid, said lipid selected from the group consisting of a
 phospholipid, a neutral phospholipid, and phosphatidylcholine.

20 56. An artificial antigen presenting cell according to claim 55 further comprising a
 surfactant components wherein said surfactant components is cholesterol and is in
 contact with at least said liposome components.

25 57. An artificial antigen presenting cell according to claim 56 wherein a label is associated
 with at least one of the group selected from the group consisting of a lipid bilayer of
 said liposome components, a lipid of said liposome components, an antigen
 components, an MHC components, a cell modulatory components, and an accessory
 components.

58. An artificial antigen presenting cell according to claim 57 wherein said label is selected from the group consisting of biotin, vancomycin, a fluorochrome, FITC, and a radiolabel.
59. An artificial antigen presenting cell according to claim 56 wherein said antigen is presented by an MHC components for contact with and recognition by a T cell receptor, said antigen selected from the group consisting of a peptide, a peptide derived from the recipient for graft versus host diseases, a cancer cell-derived peptide, a peptide derived from an allergen, a donor-derived peptide, a pathogen-derived molecule, a peptide derived by epitope mapping, a self-derived molecule, a self-derived molecule that has sequence identity with said pathogen-derived antigen, said sequence identity having a range selected from the group consisting of between 5 and 100%, 15 and 100%, 35 and 100%, and 50 and 100%.
60. An artificial antigen presenting cell according to claim 56 wherein said MHC components is selected from the group consisting of a natural MHC, a recombinant MHC having sufficient composition for binding an antigen, an $\alpha 1$ and $\alpha 2$ subunit set of a Class I MHC, an $\alpha 1$ and $\beta 2$ subunit set of a Class II MHC, a peptide derived from said α and β subunits, and a portion of a natural MHC having sufficient composition for binding an antigen.
61. An artificial antigen presenting cell according to claim 56 wherein said accessory molecule components is LFA-1, CD11a/18, CD54(ICAM-1), CD106(VCAM), and CD49d/29(VLA-4), and antibodies to the ligands of the foregoing molecules.

62. An artificial antigen presenting cell according to claim 56 wherein said cell modulation molecule components is selected from the group consisting of CD72, CD22, CD58, anti-CD22, anti-CD58, anti-CD72, anti-cytokine receptor, and anti-chemokine receptor.
- 5 63. An artificial antigen presenting cell according to claim 56 further comprising a GM-1 protein components, said GM-1 components contacting at least said liposome components.
- 10 64. An artificial antigen presenting cell according to claim 63 further comprising a cholera β subunit components wherein said β subunit components is connected to at least one of said MHC, said cell modulation, and said accessory components and further contacts at least said GM-1 components.
- 15 65. An artificial antigen presenting cell according to claim 54 further comprising molecular components selected from the group consisting of an adhesion molecule components, a co-stimulatory molecule components, GM-1 protein components, cholera toxin β subunit components, an irrelevant molecule components for binding said artificial presenting cell to a solid support or binding a label, and a label components.
- 20 66. An artificial antigen presenting cell according to claim 65 wherein said liposome components comprises a lipid, said lipid selected from the group consisting of a phospholipid, a neutral phospholipid, and phosphatidylcholine.
- 25 67. An artificial antigen presenting cell according to claim 66 further comprising a surfactant components wherein said surfactant components is cholesterol and is in contact with at least said liposome components.

- 5

10

15

20

25

that has sequence identity with said pathogen-derived antigen, said sequence identity having a range selected from the group consisting of between 5 and 100%, 15 and 100%, 35 and 100%, and 50 and 100%.

- 5 73. An artificial antigen presenting cell according to claim 67 wherein said MHC components is selected from the group consisting of a natural MHC, a recombinant MHC having sufficient composition for binding an antigen, an $\alpha 1$ and $\alpha 2$ subunit set of a Class I MHC, an $\alpha 1$ and $\beta 2$ subunit set of a Class II MHC, a peptide derived from said α and β subunits, and a portion of a natural MHC having sufficient composition for binding an antigen.
- 10
74. An artificial antigen presenting cell according to claim 67 wherein said accessory molecule components is selected from the group consisting of LFA-1, CD11a/18, CD54(ICAM-1), CD106(VCAM), and CD49d/29(VLA-4), and antibodies to the
- 15 ligands of the foregoing molecules.
75. An artificial antigen presenting cell according to claim 67 wherein said co-stimulatory molecule components is selected from the group consisting of B7-1, B7-2, CD5, CD9, CD2, CD40 and antibodies to their ligands.
- 20
76. An artificial antigen presenting cell according to claim 67 wherein said cell modulation molecule components is selected from the group consisting of CD72, CD22, CD58, anti-CD22, anti-CD58, anti-CD72, anti-cytokine receptor, and anti-chemokine receptor.
- 25 77. An artificial antigen presenting cell according to claim 67 wherein said adhesion molecule components is selected from the group consisting of ICAM-1, ICAM-2,

GlyCAM-1, CD34, anti-LFA-1, anti-CD44, anti-beta7, chemokines, CXCR4, CCR5, anti-selectin L, anti-selectin E, and anti-selectin P.

78. An artificial antigen presenting cell according to 67 wherein said irrelevant molecule
5 components, has a moiety for binding a solid support either directly or through an
intermediate molecule, or for binding a label, said solid support further selected from
the group consisting of a glass bead from 25 to 300 μm diameter, and a magnetic bead
from 25 to 300 μm diameter.
- 10 79. An artificial antigen presenting cell according to claim 78 wherein said solid support is
coated with a lipid selected from the group consisting of a phospholipid, a neutral
phospholipid, and phosphatidylcholine, said solid support further having capture
molecules, said capture molecules further having the capacity to bind specifically to
said irrelevant molecule components.
- 15 80. An artificial antigen presenting cell according to claim 79 wherein said capture
molecules are noncovalently associated with said lipid.
- 20 81. An artificial antigen presenting cell comprising:
- (a) a liposome components;
 - (b) an MHC components;
 - (c) an antigen components,
 - (d) an accessory molecule components,
 - 25 (e) a co-stimulatory molecule components; and
 - (f) a cell modulation molecule components, wherein said antigen components is in
contact with at least said MHC components, said MHC, accessory, co-
stimulatory, and cell modulation components are in contact with at least said

liposome components, said accessory molecule components further providing for a stabilizing property to an interaction between a T cell receptor and said MHC components and said antigen components.

- 5 82. An artificial antigen presenting cell according to claim 81 wherein said liposome components comprises a lipid, said lipid selected from the group consisting of a phospholipid, a neutral phospholipid, and phosphotidylcholine.
83. An artificial antigen presenting cell according to claim 82 further comprising a surfactant components wherein said surfactant component is cholesterol and is in
10 contact with at least said liposome components.
84. An artificial antigen presenting cell according to claim 83 wherein a label is associated with at least one of the group selected from the group consisting of a lipid bilayer of said liposome components, a lipid of said liposome components, an antigen
15 components, an MHC components, a co-stimulatory components, a cell modulation molecule components, and an accessory components.
85. An artificial antigen presenting cell according to claim 84 wherein said label is selected from the group consisting of biotin, vancomycin, a fluorochrome, FITC, and a
20 radiolabel.
86. An artificial antigen presenting cell according to claim 83 wherein said antigen is presented by an MHC components for contact with and recognition by a T cell receptor, said antigen selected from the group consisting of a peptide, a peptide derived
25 from the recipient for graft versus host diseases, a cancer cell-derived peptide, a peptide derived from an allergen, a donor-derived peptide, a pathogen-derived molecule, a peptide derived by epitope mapping, a self-derived molecule, a self-derived molecule

that has sequence identity with said pathogen-derived antigen, said sequence identity having a range selected from the group consisting of between 5 and 100%, 15 and 100%, 35 and 100%, and 50 and 100%.

- 5 87. An artificial antigen presenting cell according to claim 83 wherein said MHC components is selected from the group consisting of a natural MHC, a recombinant MHC having sufficient composition for binding an antigen, an α 1 and α 2 subunit set of a Class I MHC, an α 1 and β 2 subunit set of a Class II MHC, a peptide derived from said α and β subunits, and a portion of a natural MHC having sufficient composition for
- 10 binding an antigen.
88. An artificial antigen presenting cell according to claim 83 wherein said accessory molecule components is LFA-1, CD11a/18, CD54(ICAM-1), CD106(VCAM), and CD49d/29(VLA-4), and antibodies to the ligands of the foregoing molecules.
- 15 89. An artificial antigen presenting cell according to claim 83 wherein said co-stimulatory molecule components is selected from the group consisting of B7-1, B7-2, CD5, CD9, CD2, CD40 and antibodies to their ligands.
- 20 90. An artificial antigen presenting cell according to claim 83 wherein said cell modulation molecule components is selected from the group consisting of a cytokine, a chemokine, CD72, CD22, CD58, anti-CD22, anti-CD58, anti-CD72, anti-cytokine receptor, and anti-chemokine receptor.
- 25 91. An artificial antigen presenting cell according to claim 83 further comprising a GM-1 protein components, said GM-1 components contacting at least said liposome components.

92. An artificial antigen presenting cell according to claim 91 further comprising a cholera
β subunit component wherein said β subunit component is connected to at least one of
said MHC, said co-stimulatory, cell modulation molecule component, and said
5 accessory components and further contacts at least said GM-1 components.
93. An artificial antigen presenting cell according to claim 81 further comprising molecular
components selected from the group consisting of an adhesion molecule components,
GM-1 protein components, cholera toxin β subunit components, an irrelevant molecule
10 components for binding said artificial presenting cell to a solid support or binding a
label, and a label components.
94. An artificial antigen presenting cell according to claim 93 wherein said liposome
components comprises a lipid, said lipid selected from the group consisting of a
15 phospholipid, a neutral phospholipid, and phosphatidylcholine.
95. An artificial antigen presenting cell according to claim 94 further comprising a
surfactant components wherein said surfactant components is cholesterol and is in
contact with at least said liposome components.
- 20 96. An artificial antigen presenting cell according to claim 95 wherein a label is associated
with at least one of the group selected from the group consisting of a lipid bilayer of
said liposome components, a lipid of said liposome components, an antigen
components, an MHC components, a co-stimulatory molecule components, an
adhesion molecule components, a cell modulation molecule components, GM-1 protein
25 components, cholera toxin β subunit components, an irrelevant molecule components
and an accessory components.

97. An artificial antigen presenting cell according to claim 96 wherein said label is selected from the group consisting of biotin, vancomycin, a fluorochrome, FITC, and a radiolabel.
- 5 98. An artificial antigen presenting cell according to claim 95 wherein said GM-1 components contacts at least said liposome components.
- 10 99. An artificial antigen presenting cell according to claim 98 wherein said cholera β subunit component is connected to at least one of said MHC components, co-stimulatory molecule components, an adhesion molecule components, a cell modulation molecule components, an irrelevant molecule components, and said accessory components and further contacts at least said GM-1 components.
- 15 100. An artificial antigen presenting cell according to claim 95 wherein said antigen is presented by an MHC components for contact with and recognition by a T cell receptor, said antigen selected from the group consisting of a peptide, a peptide derived from the recipient for graft versus host diseases, a cancer cell-derived peptide, a peptide derived from an allergen, a donor-derived peptide, a pathogen-derived molecule, a peptide derived by epitope mapping, a self-derived molecule, a self-derived molecule that has sequence identity with said pathogen-derived antigen, said sequence identity having a range selected from the group consisting of between 5 and 100%, 15 and 100%, 35 and 100%, and 50 and 100%.
- 20 101. An artificial antigen presenting cell according to claim 95 wherein said MHC components is selected from the group consisting of a natural MHC, a recombinant MHC having sufficient composition for binding an antigen, an $\alpha 1$ and $\alpha 2$ subunit set of

a Class I MHC, an $\alpha 1$ and $\beta 2$ subunit set of a Class II MHC, a peptide derived from said α and β subunits, and a portion of a natural MHC having sufficient composition for binding an antigen.

- 5 102. An artificial antigen presenting cell according to claim 95 wherein said accessory molecule components is selected from the group consisting of LFA-1, CD11a/18, CD54(ICAM-1), CD106(VCAM), and CD49d/29(VLA-4), and antibodies to the ligands of the foregoing molecules.
- 10 103. An artificial antigen presenting cell according to claim 95 wherein said co-stimulatory molecule components is selected from the group consisting of B7-1, B7-2, CD5, CD9, CD2, CD40 and antibodies to their ligands.
- 15 104. An artificial antigen presenting cell according to claim 95 wherein said cell modulation molecule components is selected from the group consisting of CD72, CD22, CD58, anti-CD22, anti-CD58, anti-CD72, anti-cytokine receptor, and anti-chemokine receptor.
- 20 105. An artificial antigen presenting cell according to claim 95 wherein said adhesion molecule components is selected from the group consisting of ICAM-1, ICAM-2, GlyCAM-1, CD34, anti-LFA-1, anti-CD44, anti-beta7, chemokines, CXCR4, CCR5, anti-selectin L, anti-selectin E, and anti-selectin P.
- 25 106. An artificial antigen presenting cell according to 95 wherein said irrelevant molecule components, has a moiety for binding a solid support either directly or through an intermediate molecule, or for binding a label, said solid support further

selected from the group consisting of a glass bead from 25 to 300 μm diameter, and a magnetic bead from 25 to 300 μm diameter.

- 5 107. An artificial antigen presenting cell according to claim 106 wherein said solid support is coated with a lipid selected from the group consisting of a phospholipid, a neutral phospholipid, and phosphatidylcholine, said solid support further having capture molecules, said capture molecules further having the capacity to bind specifically to said irrelevant molecule components.
- 10 108. An artificial antigen presenting cell according to claim 107 wherein said capture molecules are noncovalently associated with said lipid.
- 15 109. An artificial antigen presenting cell comprising:
- a. a liposome components;
 - b. an MHC components;
 - c. an antigen components;
 - d. an accessory molecule components;
 - e. a co-stimulatory molecule components;
 - f. a cell modulation molecule components;
 - 20 g. an adhesion molecule components;
 - h. an irrelevant molecule components; and
 - i. a cholesterol components, wherein said antigen components is in contact with at least said MHC components, said MHC, accessory, co-stimulatory, cell modulation, adhesion, irrelevant, and said cholesterol components are in contact with at least said liposome components, said accessory molecule components
- 25 further providing a stabilizing property to an interaction between a T cell receptor and said MHC components and said antigen components.

110. An artificial antigen presenting cell according to claim 109 wherein said liposome components comprises a lipid, said lipid selected from the group consisting of a phospholipid, a neutral phospholipid, and phosphotidylcholine.
111. An artificial antigen presenting cell according to claim 110 wherein a label is
5 associated with at least one of the group selected from the group consisting of a lipid bilayer of said liposome components, a lipid of said liposome components, an antigen components, an MHC components, a co-stimulatory components, a cell modulation molecule components, an adhesion molecule components, an irrelevant molecule components, a cholesterol components, and an accessory components.
112. An artificial antigen presenting cell according to claim 111 wherein said label is
10 selected from the group consisting of biotin, vancomycin, a fluorochrome, FITC, and a radiolabel.
113. An artificial antigen presenting cell according to claim 110 wherein said antigen is
15 presented by an MHC components for contact with and recognition by a T cell receptor, said antigen selected from the group consisting of a peptide, a peptide derived from the recipient for graft versus host diseases, a cancer cell-derived peptide, a peptide derived from an allergen, a donor-derived peptide, a pathogen-derived molecule, a
20 peptide derived by epitope mapping, a self-derived molecule, a self-derived molecule that has sequence identity with said pathogen-derived antigen, said sequence identity having a range selected from the group consisting of between 5 and 100%, 15 and 100%, 35 and 100%, and 50 and 100%.
114. An artificial antigen presenting cell according to claim 110 wherein said MHC
25 components is selected from the group consisting of a natural MHC, a recombinant

MHC having sufficient composition for binding an antigen, an $\alpha 1$ and $\alpha 2$ subunit set of a Class I MHC, an $\alpha 1$ and $\beta 2$ subunit set of a Class II MHC, a peptide derived from said α and β subunits, and a portion of a natural MHC having sufficient composition for binding an antigen.

5

115. An artificial antigen presenting cell according to claim 110 wherein said accessory molecule components is LFA-1, CD11a/18, CD54(ICAM-1), CD106(VCAM), and CD49d/29(VLA-4), and antibodies to the ligands of the foregoing molecules.

10 116. An artificial antigen presenting cell according to claim 110 wherein said co-stimulatory molecule components is selected from the group consisting of B7-1, B7-2, CD5, CD9, CD2, CD40 and antibodies to their ligands.

15 117. An artificial antigen presenting cell according to claim 110 wherein said cell modulation molecule components is selected from the group consisting of a cytokine, a chemokine, CD72, CD22, CD58, anti-CD22, anti-CD58, anti-CD72, anti-cytokine receptor, and anti-chemokine receptor.

20 118. An artificial antigen presenting cell according to claim 110 wherein said adhesion molecule components is selected from the group consisting of ICAM-1, ICAM-2, GlyCAM-1, CD34, anti-LFA-1, anti-CD44, anti-beta7, chemokines, CXCR4, CCR5, anti-selectin L, anti-selectin E, and anti-selectin P.

25 119. An artificial antigen presenting cell according to claim 110 wherein said irrelevant molecule components, has a moiety for binding a solid support either directly or through an intermediate molecule, or for binding a label, said solid support further

selected from the group consisting of a glass bead from 25 to 300 μm diameter, and a magnetic bead from 25 to 300 μm diameter.

- 5 120. An artificial antigen presenting cell according to claim 119 wherein said solid support is coated with a lipid selected from the group consisting of a phospholipid, a neutral phospholipid, and phosphatidylcholine, said solid support further having capture molecules, said capture molecules further having the capacity to bind specifically to said irrelevant molecule components.
- 10 121. An artificial antigen presenting cell according to claim 120 wherein said capture molecules are noncovalently associated with said lipid.
- 15 122. An artificial antigen presenting cell according to claim 110 further comprising a GM-1 protein components, said GM-1 components contacting at least said liposome components.
- 20 123. An artificial antigen presenting cell according to claim 122 further comprising a cholera β subunit components wherein said β subunit components is connected to at least one of said MHC, said co-stimulatory, cell modulation molecule component, adhesion, irrelevant, and said accessory components and further contacts at least said GM-1 components.
- 25 124. An artificial antigen presenting cell comprising:
- a. a solid support components;
 - b. a liposome components;
 - c. an MHC components;
 - d. an antigen components; and

e. an accessory molecule components, wherein said solid support components comprise a glass or magnetic spheroid, liposome components is contacted either covalently or noncovalently with said solid support components, said antigen components is in contact with at least said MHC components, said MHC, and accessory components are in contact with at least said liposome components, said accessory molecule components further providing a stabilizing property to an interaction between a T cell receptor and said MHC components and said antigen components.

10 125. An artificial antigen presenting cell according to claim 124 wherein said liposome components comprises a lipid, said lipid selected from the group consisting of a phospholipid, a neutral phospholipid, and phosphatidylcholine.

126. An artificial antigen presenting cell according to claim 125 further comprising a surfactant components wherein said surfactant components is cholesterol and is in
15 contact with at least said liposome components.

127. An artificial antigen presenting cell according to claim 126 wherein a label is associated with at least one of the group selected from the group consisting of a lipid layer of said liposome component, a lipid of said liposome component, an antigen, an
20 MHC, and an accessory components.

128. An artificial antigen presenting cell according to claim 127 wherein said label is selected from the group consisting of biotin, vancomycin, a fluorochrome, FITC, and a radiolabel.

25

129. An artificial antigen presenting cell according to claim 126 wherein said antigen is presented by an MHC components for contact with and recognition by a T cell receptor, said antigen selected from the group consisting of a peptide, a peptide derived from the recipient for graft versus host diseases, a cancer cell-derived peptide, a peptide derived from an allergen, a donor-derived peptide, a pathogen-derived molecule, a peptide derived by epitope mapping, a self-derived molecule, a self-derived molecule that has sequence identity with said pathogen-derived antigen, said sequence identity having a range selected from the group consisting of between 5 and 100%, 15 and 100%, 35 and 100%, and 50 and 100%.
130. An artificial antigen presenting cell according to claim 126 wherein said MHC components is selected from the group consisting of a natural MHC, a recombinant MHC having sufficient composition for binding an antigen, an $\alpha 1$ and $\alpha 2$ subunit set of a Class I MHC, an $\alpha 1$ and $\beta 2$ subunit set of a Class II MHC, a peptide derived from said α and β subunits, and a portion of a natural MHC having sufficient composition for binding an antigen.
131. An artificial antigen presenting cell according to claim 126 wherein said accessory molecule components is selected from the group consisting of LFA-1, CD11a/18, CD54(ICAM-1), CD106(VCAM), and CD49d/29(VLA-4), and antibodies to the ligands of the foregoing molecules.
132. An artificial antigen presenting cell according to claim 126 further comprising a GM-1 protein components, said GM-1 components contacting at least said liposome components.

- 5
133. An artificial antigen presenting cell according to claim 132 further comprising a cholera β subunit components wherein said β subunit components is connected to at least one of said MHC, and said accessory components and further contacts at least said GM-1 components.
- 10
134. An artificial antigen presenting cell according to claim 124 further comprising molecular components selected from the group consisting of a co-stimulatory molecule components, an adhesion molecule components, a cell modulation molecule components, GM-1 protein components, cholera toxin β subunit components, an irrelevant molecule components for binding said artificial presenting cell to a solid support or binding a label, and a label components.
- 15
135. An artificial antigen presenting cell according to claim 134 wherein said liposome components comprises a lipid, said lipid selected from the group consisting of a phospholipid, a neutral phospholipid, and phosphatidylcholine.
- 20
136. An artificial antigen presenting cell according to claim 135 further comprising a surfactant components wherein said surfactant components is cholesterol and is in contact with at least said liposome components.
- 25
137. An artificial antigen presenting cell according to claim 136 wherein a label is associated with at least one of the group selected from the group consisting of a lipid layer of said liposome components, a lipid of said liposome components, an antigen components, an MHC components, a co-stimulatory molecule components, an adhesion molecule components, a cell modulation molecule components, GM-1 protein components, cholera toxin β subunit components, an irrelevant molecule components and an accessory components.

138. An artificial antigen presenting cell according to claim 137 wherein said label is selected from the group consisting of biotin, vancomycin, a fluorochrome, FITC, and a radiolabel.
- 5
139. An artificial antigen presenting cell according to claim 136 wherein said GM-1 components contacts at least said liposome components.
140. An artificial antigen presenting cell according to claim 139 wherein said cholera β subunit component is connected to at least one of said co-stimulatory molecule components, an adhesion molecule components, a cell modulation molecule components, an irrelevant molecule components, and said accessory components and further contacts at least said GM-1 components.
- 10
141. An artificial antigen presenting cell according to claim 136 wherein said antigen is presented by an MHC components for contact with and recognition by a T cell receptor, said antigen selected from the group consisting of a peptide, a peptide derived from the recipient for graft versus host diseases, a cancer cell-derived peptide, a peptide derived from an allergen, a donor-derived peptide, a pathogen-derived molecule, a peptide derived by epitope mapping, a self-derived molecule, a self-derived molecule that has sequence identity with said pathogen-derived antigen, said sequence identity having a range selected from the group consisting of between 5 and 100%, 15 and 100%, 35 and 100%, and 50 and 100%.
- 15
- 20
- 25 142. An artificial antigen presenting cell according to claim 136 wherein said MHC components is selected from the group consisting of a natural MHC, a recombinant MHC having sufficient composition for binding an antigen, an $\alpha 1$ and $\alpha 2$ subunit set of

a Class I MHC, an $\alpha 1$ and $\beta 2$ subunit set of a Class II MHC, a peptide derived from said α and β subunits, and a portion of a natural MHC having sufficient composition for binding an antigen.

- 5 143. An artificial antigen presenting cell according to claim 136 wherein said accessory molecule components is selected from the group consisting of LFA-1, CD11a/18, CD54(ICAM-1), CD106(VCAM), and CD49d/29(VLA-4), and antibodies to the ligands of the foregoing molecules.
- 10 144. An artificial antigen presenting cell according to claim 136 wherein said co-stimulatory molecule components is selected from the group consisting of B7-1, B7-2, CD5, CD9, CD2, CD40 and antibodies to their ligands.
- 15 145. An artificial antigen presenting cell according to claim 136 wherein said cell modulation molecule components is selected from the group consisting of CD72, CD22, CD58, anti-CD22, anti-CD58, anti-CD72, anti-cytokine receptor, and anti-chemokine receptor.
- 20 146. An artificial antigen presenting cell according to claim 136 wherein said adhesion molecule components is selected from the group consisting of ICAM-1, ICAM-2, GlyCAM-1, CD34, anti-LFA-1, anti-CD44, anti-beta7, chemokines, CXCR4, CCR5, anti-selectin L, anti-selectin E, and anti-selectin P.
- 25 147. An artificial antigen presenting cell according to 136 wherein said irrelevant molecule components has a moiety for binding a solid support either directly or through an intermediate molecule or for binding a label, said solid support further

selected from the group consisting of a glass bead from 25 to 300 μm diameter, and a magnetic bead from 25 to 300 μm diameter.

148. An artificial antigen presenting cell according to claim 147 wherein said solid
5 support is coated with a lipid selected from the group consisting of a phospholipid, a neutral phospholipid, and phosphatidylcholine, said solid support further having capture molecules, said capture molecules further having the capacity to bind specifically to said irrelevant molecule.
- 10 149. An artificial antigen presenting cell according to claim 148 wherein said capture molecules are noncovalently associated with said lipid.
150. A method of making an artificial antigen presenting cell comprising:
(a) obtaining an MHC:antigen complex of interest;
15 (b) contacting said MHC:antigen complex with a lipid and cholesterol and forming a lipid membrane-associated MHC:antigen complex; and
(c) contacting said membrane-associated MHC:antigen complex resulting from step (b) with a molecule of interest, said molecule of interest comprising at least one of molecules selected from the group consisting of an accessory molecule, a co-stimulatory molecule, a cell modulation molecule, an adhesion molecule, an irrelevant molecule, cholesterol, GM-1 protein, cholera toxin β subunit protein, and a label.
20
151. A method according to claim 150 wherein steps (b) and (c) are performed
25 simultaneously.
152. A method according to claim 151 wherein said MHC components is selected from the group consisting of a natural MHC, a recombinant MHC having sufficient

composition for binding an antigen, an $\alpha 1$ and $\alpha 2$ subunit set of a Class I MHC, an $\alpha 1$ and $\beta 2$ subunit set of a Class II MHC, a peptide derived from said α and β subunits, and a portion of a natural MHC having sufficient composition for binding an antigen.

- 5 153. A method according to claim 151 wherein said antigen is presented by an MHC components for contact with and recognition by a T cell receptor, said antigen selected from the group consisting of a peptide, a peptide derived from the recipient for graft versus host diseases, a cancer cell-derived peptide, a peptide derived from an allergen, a donor-derived peptide, a pathogen-derived molecule, a peptide derived by epitope mapping, a self-derived molecule, a self-derived molecule that has sequence identity with said pathogen-derived antigen, said sequence identity having a range selected from the group consisting of between 5 and 100%, 15 and 100%, 35 and 100%, and 50 and 100%.
- 10 154. A method according to claim 151 wherein said accessory molecule components is selected from the group consisting of LFA-1, CD11a/18, CD54(ICAM-1), CD106(VCAM), and CD49d/29(VLA-4), and antibodies to the ligands of the foregoing molecules.
- 15 20 155. A method according to claim 151 wherein said co-stimulatory molecule components is selected from the group consisting of B7-1, B7-2, CD5, CD9, CD2, CD40 and antibodies to their ligands.
- 25 156. A method according to claim 151 wherein said cell modulation molecule components is selected from the group consisting of CD72, CD22, CD58, anti-CD22, anti-CD58, anti-CD72, anti-cytokine receptor, and anti-chemokine receptor.

157. A method according to claim 151 wherein said adhesion molecule components is selected from the group consisting of ICAM-1, ICAM-2, GlyCAM-1, CD34, anti-LFA-1, anti-CD44, anti-beta7, chemokines, CXCR4, CCR5, anti-selectin L, anti-selectin E, and anti-selectin P.

5

158. A method according to claim 151 wherein a label is associated with at least one of the group selected from the group consisting of a lipid layer of said liposome components, a lipid of said liposome components, an antigen components, an MHC components, a co-stimulatory molecule components, an adhesion molecule components, a cell modulation molecule components, GM-1 protein components, cholera toxin β subunit components, an irrelevant molecule components and an accessory components.

10

159. A method according to claim 158 wherein said label is selected from the group consisting of biotin, vancomycin, a fluorochrome, FITC, and a radiolabel.

15

160. A method according to claim 151 wherein said GM-1 component contacts at least said liposome components.

20

161. A method according to claim 160 wherein said cholera β subunit components is connected to at least one of said co-stimulatory molecule components, an adhesion molecule components, a cell modulation molecule components, an irrelevant molecule components, and said accessory components and further contacts at least said GM-1 components.

25

162. A method of identifying T cells specific for an antigen of interest comprising:
(a) obtaining a biological sample containing T cells which are specific for an antigen of interest;

Sub
C1

5

10

15

20

25

- 163.

Sub C1
molecule components, a co-stimulatory components, an adherent components, a cell modulation components, and an accessory molecule components;

- (d) removing said artificial antigen presenting cell:T cell complex formed in step (c) from said biological sample; and
- 5 (e) separating T cells specific for said antigen of interest from said artificial antigen presenting cell:T cell complex.

164. A method according to claim 163 further comprising the step of:
- (f) determining a quantity of T cells specific for said antigen of interest.

- 10 165. A method according to claim 164 further comprising the step of:
- (g) characterizing the functional phenotype of said isolated T cells specific for said antigen of interest.

- 15 166. A method according to claim 163 wherein said biological sample is selected from the group consisting of whole blood, blood cells, blood plasma, and tissue.

167. A method according to claim 166 wherein said biological sample is selected from the group consisting of whole blood, blood cells, blood plasma, and tissue.

- 20 168. A method of modulating T cell response comprising:
- (a) isolating T cells which are specific for an antigen of interest using a method of claim 163; and
- (b) contacting said isolated T cells with an artificial antigen presenting cell
- 25 comprising attributes of any of the claims selected from the group consisting of claim 1, claim 3, claim 4, claim 11, claim 13, claim 14, claim 17, claim 27, claim 29, claim 31, claim 38, claim 40, claim 44, claim 54, claim 56, claim 57, claim 65, claim 67, claim 68, claim 71, claim 81, claim 84, claim 93, claim 95, claim 96, claim 99, wherein said antigen presenting cell has an antigen of

Sub
C2/

interest or a homologue of said antigen of interest, said artificial antigen presenting cell further having at least one molecule selected from the group consisting of an accessory molecule components, a co-stimulatory components, an adhesion components, and a cell modulation components.

5

169. A method according to claim 168 wherein said modulation of T cell response comprises changing in whole or in part the functional pattern of cytokine production by said isolated T cells from a Th-1 response to a Th-2 response.

10 170. A method according to claim 169 wherein said artificial antigen presenting cell expresses a co-stimulatory molecule B7-2.

171. A method according to claim 168 wherein said modulation of T-cell response comprises changing in whole or in part the functional pattern of cytokine production by said isolated T cells from a Th-2 response to a Th-1 response.

15

172. A method according to claim 171 wherein said artificial antigen presenting cell expresses a co-stimulatory molecule B7-1.

20 173. A method according to claim 168 wherein said modulation of T cell response comprises inducing anergy.

174. A method according to claim 168 wherein said modulation of T cell response comprises inducing proliferation of T cells.

25

175. A method according to claim 168 wherein said artificial antigen presenting cell expresses anti-CD-28 so as to facilitate T-cell proliferation.

Sub
C3

176. A method of characterizing the functional state of antigen-specific T cells comprising:

Sub
C3

- 5
- (e) isolating T cells in accordance with the method of claim 163;
 - (f) extracting mRNA from said isolated T cells;
 - (g) obtaining cDNA corresponding to said extracted mRNA;
 - (h) evaluating the mRNA encoding proteins that govern function and phenotype of said antigen-specific T cells, said evaluation carried out by a method selected from the group consisting of (1) mRNA translation of said proteins and testing said proteins using antibodies against such proteins, and (2) rtPCR of the mRNA using primers specific for said proteins.

10 177. A method according to claim 176 wherein said evaluation of the mRNA encoding proteins that govern function and phenotype of said antigen-specific T cell is used to determine efficacy of an immunomodulation treatment regimen.

15 178. A method according to claim 177 wherein said immunomodulation treatment comprises administering a vaccine.

179. A method according to claim 177 wherein said immunomodulation treatment comprises inducing tolerance in autoimmunity.

20 180. A method according to claim 177 wherein said immunomodulation treatment comprises reducing allergic response.

25 181. A method according to claim 177 wherein said immunomodulation treatment comprises inducing an immune response against cancer cells.

182. A method according to claim 177 wherein said proteins that govern function and phenotype of said antigen-specific T cells include a cytokine.

30 183. A method according to claim 177 wherein said proteins that govern function and phenotype of said antigen-specific T cells include a chemokine.

184. A method according to claim 177 wherein said proteins that govern function and phenotype of said antigen-specific T cells include a chemokine receptor.
- 5 185. A method according to claim 177 wherein said proteins that govern function and phenotype of said antigen-specific T cells include a cytokine receptor.
186. A method of treating a condition in a subject which would be benefited by altering the functional pattern of cytokine production by certain antigen-specific T cells to
- 10 increase Th-2 response and/or decrease Th-1 response comprising:
- (a) isolating T cells in accordance with the method of claim 163 which are specific for an antigen capable of triggering a Th-1 response upon recognition of said antigen by said subject's T cells; and
 - (b) combining said isolated T cells with an artificial antigen presenting cell having
- 15 a MHC component capable of binding said antigen and a co-stimulatory molecule component comprising B7-2.
187. A method according to claim 186 wherein said condition is an autoimmune disease.
- 20 188. A method according to claim 187 wherein said autoimmune disease is selected from the group consisting of type I diabetes mellitus, multiple sclerosis, rheumatoid arthritis, dermatomyositis, juvenile rheumatoid arthritis and uveitis.
189. A method of treating a condition in a subject which would be benefited by
- 25 increasing Th-1 response and/or decreasing Th-2 response comprising:
- (a) isolating T cells in accordance with the method of claim 163 which are specific for an antigen capable of triggering a Th-2 response upon recognition of said antigen by said subject's T cells; and

(b) combining said isolated T cells with an artificial antigen presenting cell having an MHC component capable of binding said antigen and a co-stimulatory molecule component B7-1.

5 190. A method according to claim 189 wherein said condition is an allergy.

191. A method according to claim 190 wherein said allergy is to allergen selected from the group consisting of dust, animal skin bypass products, vegetables, fruits, pollen and chemicals.

10

192. A method according to claim 189 wherein said condition is a cancer.

193. A method according to claim 189 wherein said condition is a viral infection.

15 194. A method according to claim 189 wherein said condition is a bacterial infection.

195. A method of identifying antigen-specific T cells specific for epitopes on a graft donor's tissue likely to elicit graft vs. host rejection response comprising:

20

(a) predicting epitopes of a donor's MHC likely to be antigenic by computer modeling; and

(b) testing the predicted epitopes with a recipient's T cells to identify T cells specific for said epitopes according to claim 162.

25

196. A method of treating a recipient mammal to reduce rejection of allografts in a transplantation therapy regimen comprising:

(a) predicting epitopes of a donor's MHC likely to be antigenic by computer modeling;

(b) testing the predicted epitopes with a recipient's T cells to identify T cells specific for said epitopes according to claim 162;

30

(c) using the epitopes as antigen in an artificial APC;

- (d) contacting said artificial APC of (c) with a biological sample from said recipient to form an artificial APC:epitope specific T cell complex, said sample further comprising T cells specific for said epitope;
- (e) removing said complex formed in (d) from said biological sample so as to deplete a recipient's T cell population of T cells specific for said epitope.

197. A kit for isolation and/or modulation of T cells specific for an antigen of interest comprising components selected from the group consisting of
- (a) artificial APCs;
 - (b) solid supports;
 - (c) reagents; and
 - (d) an immunomodulatory column device.
198. A kit according to claim 197 wherein said artificial APCs have components in any combination, said components selected from the group consisting of lipids, neutral phospholipids, phosphatidylcholine, cholesterol, solid supports, full length MHC components or portions thereof sufficient to bind an antigen, said MHC components specific for an antigen, antigens, accessory molecules, co-stimulatory molecules, adhesion molecules, modulation molecules, irrelevant molecules, and labels.
199. A kit according to claim 198 wherein said solid supports are selected from the group consisting of a glass bead from 25 to 300 μm diameter, and a magnetic bead from 25 to 300 μm .
200. A kit according to claim 198 wherein said MHC components is selected from the group consisting of a natural MHC, a recombinant MHC having sufficient composition for binding an antigen, an $\alpha 1$ and $\alpha 2$ subunit set of a Class I MHC, an $\alpha 1$ and $\beta 2$ subunit set of a Class II MHC, a peptide derived from said α and β subunits, and a portion of a natural MHC having sufficient composition for binding an antigen.

201. A kit according to claim 198 wherein said accessory molecule is LFA-1, CD11a/18, CD54(ICAM-1), CD106(VCAM), and CD49d/29(VLA-4), and antibodies to the ligands of the foregoing molecules.
- 5 202. A kit according to claim 198 wherein said co-stimulatory molecule component is selected from the group consisting of B7-1, B7-2, CD5, CD9, CD2, CD40 and antibodies to their ligands.
- 10 203. A kit according to claim 198 wherein said T cell modulation molecule component is selected from the group consisting of a cytokine, a chemokine, CD72, CD22, CD58, anti-CD22, anti-CD58, anti-CD72, anti-cytokine receptor, and anti-chemokine receptor.
- 15 204. A kit according to claim 198 wherein said adhesion molecule component is selected from the group consisting of ICAM-1, ICAM-2, GlyCAM-1, CD34, anti-LFA-1, anti-CD44, anti-beta7, chemokines, CXCR4, CCR5, anti-selectin L, anti-selectin E, and anti-selectin P.
- 20 205. A kit according to claim 198 wherein said antigen is presented by an MHC components for contact with and recognition by a T cell receptor, said antigen selected from the group consisting of a peptide, a peptide derived from the recipient for graft versus host diseases, a cancer cell-derived peptide, a peptide derived from an allergen, a donor-derived peptide, a pathogen-derived molecule, a peptide derived by epitope mapping, a self-derived molecule, a self-derived molecule that has sequence identity
- 25 with said pathogen-derived antigen, said sequence identity having a range selected from the group consisting of between 5 and 100%, 15 and 100%, 35 and 100%, and 50 and 100%.
206. A kit according to claim 198 wherein said antigen has a label.

207. A kit according to claim 198 wherein said irrelevant molecule components, has a moiety for binding a solid support either directly or through an intermediate molecule, or for binding a label, said solid support further selected from the group consisting of a glass bead from 25 to 300 μm diameter, and a magnetic bead from 25 to 300 μm diameter.
208. A kit according to claim 207 wherein said irrelevant molecule has a label.
209. A kit according to claim 198 wherein a lipid of said liposome has a label.
210. A kit according to claim 198 wherein said label is associated with a lipid layer of said liposome.
211. A kit according to claim 197 wherein said solid supports are selected from the group consisting of a glass bead from 25 to 300 μm diameter, and a magnetic bead from 25 to 300 μm diameter, a solid support coated with a capture molecule capable of binding to an irrelevant molecule, and a solid support coated with a lipid layer and a capture molecule capable of binding to an irrelevant molecule.
212. A kit according to claim 197 wherein said reagents comprise components in any combination, said components selected from the group consisting of (1) buffers for carrying out T cell identification, isolation, and modification, (2) media for expanding T cells, (3) co-stimulatory molecules, (4) adhesion molecules, (5) modulation molecules, (6) labels, (7) soluble factors for activating T cells, and (8) soluble factors for modulating T cells.
213. A kit according to claim 212 wherein said label is selected from the group consisting of biotin, vancomycin, a fluorochrome, FITC, and a radiolabel.

214. A kit according to claim 197 wherein said immunomodulatory column is designed according to claim 215.

5 215. An immunomodulatory column comprising:

a multiplicity of compartments positioned in relation to one another in series, said compartments having a channels interconnecting adjacent compartments, said channels further having a means to isolate said compartments from one another, said compartments further having at least one entrance and at least one exit ports for receiving or expelling,
10 respectively, a flowable medium, said ports further having a means to close said ports to impede said flowable medium, said compartments further optionally comprising components selected from the group consisting of solid supports, and artificial APCs.

15 216. A method for identifying a gene which is expressed by a T cell specific for an antigen of interest comprising:

- (g) obtaining a biological sample containing T cells which are specific for an antigen of interest;
- (h) labeling, with a first label, at least the intracellular gene product of interest produced by T cells in said biological sample;
- 20 (i) preparing a liposome:MHC:antigen complex, wherein the antigen in said liposome:MHC:antigen complex is said antigen of interest;
- (j) contacting the biological sample obtained in step (a), as labeled in accordance with step (b), with the liposome:MHC: antigen complex obtained in step (c) to form a liposome:MHC:antigen:T cell complex;
- 25 (k) labeling, with a second label, said liposome:MHC:antigen:T cell complex obtained in step (d); and
- (l) discriminating, according to antigen specificity, cells producing said intracellular gene product of interest, which cells have both the first label and the second label.

217. A method according to claim 216 wherein said first label and said second label are selected from the group consisting of biotin, a flurochrome, FITC, and a radioactive label; provided that said first label and said second label are not the same label.

5 218. A method of obtaining a monoclonal population of T cells specific for an antigen of interest comprising:

(c) isolating T cells specific for an antigen of interest in accordance with the method of claim 163; and

10 (d) culturing said T cells in an individual well with said antigen of interest and an artificial APC.

219. A method of monitoring an immunological outcome of intervention on antigen-specific and bystander T cells comprising:

15 (a) identifying antigen-specific T cells that are specific for an antigen of interest from a patient;

(b) identifying a functional phenotype of said antigen-specific T cells identified in (a); and

(c) correlating said functional phenotype with a clinical outcome of said patient.

Add
E.